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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
Preparing Activity: KSC

NASA/KSC-21 13 19.00 98 (October 2007)

Superseding
NASA/KSC-21 13 19.00 98 (February 2007)

NASA/KSC GUIDE SPECIFICATIONS

References are in agreement with UMRL dated January 2009

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NASA/KSC GUIDE SPECIFICATIONS

References are in agreement with UMRL dated January 2009
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SECTION 21 13 19.00 98

PREACTION SPRINKLER SYSTEMS
10/07

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NOTE: This specification covers the requirements for preactionfire protection sprinkler systems, hydrants, standpipe equipment, and firehose stations.

This is a performance based type of specification, with the Contractor responsible for providing professional engineering services associated with hydraulic calculations, head layout and detailed design. The preparer must estimate the system water flow demand requirements to determine the adequacy of the water supply and ascertain the need for a fire pump or water storage.

Drawings must include the following:

Current up-to-date water supply flow test data

Location and invert elevations of existing above ground obstructions and utilities that are to be avoided during construction or are required to be plugged and abandoned or demolished and removed must be shown on the working plans

Location of soil storage areas and spoil areas on government property where disposal of excess and waste material is permitted

Typical riser details

Areas to be sprinkled, hazard by class, water application density, hose requirements, temperature setting of heads, ceiling type, height, and any other special design criteria

Existing alarm-system connections

Location of fire pumps and controllers

Proper utilization and coordination of symbols, legends, or codes for various materials and classed conditions as provided in the specifications

Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable items(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments and suggestions on this guide specification are welcome and should be directed to the technical proponent of the specification. A listing of technical proponents, including their organization designation and telephone number, is on the Internet.

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PART 1 GENERAL

1.1 REFERENCES

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NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a RID outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text are automatically deleted from this section of the project specification when you choose to reconcile references in the publish print process.

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The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 317	(1992; Reprint 1999) ASD Manual of Steel Construction, Vol II: Connections

ASME INTERNATIONAL (ASME)

ASME A112.18.1	(2005) Standard for Plumbing Fixture Fittings
ASME B16.34	(2004) Valves - Flanged, Threaded and Welding End

ASME B16.39	(1998; R 2006) Standard for Malleable Iron Threaded Pipe Unions; Classes 150, 250, and 300
ASME B16.4	(2006) Standard for Gray Iron Threaded Fittings; Classes 125 and 250
ASME B16.5	(2003) Standard for Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS 24
ASME B16.9	(2007) Standard for Factory-Made Wrought Steel Buttwelding Fittings
ASME B31.1	(2007; Addenda 2008) Power Piping

ASTM INTERNATIONAL (ASTM)

ASTM A 126	(2004) Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
ASTM A 135/A 135M	(2006) Standard Specification for Electric-Resistance-Welded Steel Pipe
ASTM A 183	(2003) Standard Specification for Carbon Steel Track Bolts and Nuts
ASTM A 234/A 234M	(2007) Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service
ASTM A 307	(2007b) Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
ASTM A 53/A 53M	(2007) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A 563	(2007a) Standard Specification for Carbon and Alloy Steel Nuts
ASTM A 563M	(2007) Standard Specification for Carbon and Alloy Steel Nuts (Metric)
ASTM A 795/A 795M	(2008) Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use
ASTM C 592	(2008a) Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type)
ASTM D 2000	(2008) Standard Classification System for Rubber Products in Automotive Applications

ASTM F 568M	(2007) Standard Specification for Carbon and Alloy Steel Externally Threaded Metric Fasteners

FM GLOBAL (FM)

FM P7825	(2005) Approval Guide

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-58	(2002) Standard for Pipe Hangers and Supports - Materials, Design and Manufacture

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 13	(2006; Errata 2007; Amendment 1 2008) Installation of Sprinkler Systems
NFPA 13E	(2005) Fire Department Operations in Properties Protected by Sprinkler and Standpipe Systems
NFPA 14	(2006) Standard for the Installation of Standpipe, Private Hydrants and Hose Systems
NFPA 1963	(2003) Standard for Fire Hose Connections
NFPA 24	(2006) Standard for the Installation of Private Fire Service Mains and Their Appurtenances
NFPA 251	(1999) Methods of Tests of Fire Endurance of Building Construction and Methods
NFPA 70	(2007; AMD 1 2008) National Electrical Code - 2008 Edition
NFPA 72	(2006) National Fire Alarm Code
NFPA 75	(2008) Protection of Information Technology Equipment

NATIONAL INSTITUTE FOR CERTIFICATION IN ENGINEERING TECHNOLOGIES (NICET)

NICET 1014-7	(2003) Program Detail Manual for Certification in the Field of Fire Protection Engineering Technology (Field Code 003) Subfield of Automatic Sprinkler System Layout

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-STD-101	(Rev B) Color Code for Pipelines & for Compressed Gas Cylinders

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FED-STD-595	(Rev B; Am 1) Colors Used in Government Procurement
FS A-A-1922	(Rev A) Shield, Expansion (Caulking Anchors, Single Lead)
FS A-A-1923	(Rev A; Notice 1) Shield, Expansion (Lag, Machine and Externally threaded Wedge Bolt Anchors)
FS A-A-1924	(1995, R 2001-Rev A) Standard for Shield, Expansion; (Self Drilling Tubular Expansion Shell Bolt Anchors)
FS A-A-1925	(Rev A; Notice 1) Shield, Expansion (Nail Anchors)
FS A-A-55614	(1995) Shield, Expansion (Non-Drilling Expansion Anchors)
FS A-A-55615	(1995) Shield, Expansion (Wood Screw and Lag Bolt Self-Threading Anchors)

UNDERWRITERS LABORATORIES (UL)

UL 6	(2007) Standard for Electrical Rigid Metal Conduit-Steel
UL Fire Prot Dir	(2008) Fire Protection Equipment Directory

1.2 GENERAL

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NOTE: If Section 23 00 00 AIR SUPPLY, DISTRIBUTION, AND EXHAUST SYSTEMS is not included in the project specification, insert applicable requirements therefrom and delete the following paragraph.
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Section 23 00 00 AIR SUPPLY, DISTRIBUTION, AND EXHAUST SYSTEMS applies to work specified in this section. Design and installation must be in accordance with NFPA Standards. The interpretation of NFPA Standards rests with the [Kennedy Space Center] [Cape Canaveral Air Force Station] Fire Protection Engineer who is the Authority Having Jurisdiction (AHJ), and whose opinion is final.

This is a performance based specification with the Contractor responsible for providing engineering design, installation and testing associated with the work to be performed. Design work must be performed by a "delegated engineer", as defined under Florida Statutes, Chapter 471, who must be a Professional Engineer, competent in fire protection engineering, licensed to practice in Florida.

1.3 SUBMITTALS

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NOTE: Review Submittal Description (SD) definitions

in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list to reflect only the submittals required for the project. Keep submittals to the minimum required for adequate quality control.

A "G" following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a "G". Only delete an existing "G" if the submittal item is not complex and can be reviewed through the Contractor's Quality Control system. Only add a "G" if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, use a code of up to three characters within the submittal tags following the "G" designation to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.

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Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are [for Contractor Quality Control approval.][for information only. When used, a designation following the "G" designation identifies the office that reviews the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Submit Records of Existing Conditions and Contractor's State Certificationin accordance with paragraph entitled, "General Requirements," of this section.

Fully verified and dated copies of all test data and results must be submitted with a copy of the approved test procedure and any factory test information

Provide one copy of the test procedures and recording forms for the preliminary tests. For the final acceptance tests, provide 10 copies of the test procedures and recording forms.

SD-02 Shop Drawings

The following Connection Diagrams,Drawings, and Survey Results must be submitted in accordance with paragraph entitled, "General Requirements," of this section.

Connection Diagrams
Schematics and Fabrication Drawings
Fire Service Floor Plans
Records of Existing Conditions
Design Analysis and Calculations

Submit Schematics and Fabrication Drawings for Preaction Sprinkler Systems in accordance with paragraph entitled, "General Requirements," of this section.

Submit Fabrication Drawings for Preaction Sprinkler Systems consisting of fabrication and assembly drawings to be performed in the shop prior to installation. Fabrication drawings must meet all requirements in NFPA 13, stipulated for "working plans" to include a building cross section. Working plans must be signed and sealed by a Professional Engineer, licensed to practice in Florida.

Submit As-Built drawings in accordance with paragraph entitled, "General Requirements," of this section.

SD-03 Product Data

Submit manufacturer's catalog data for the following items in sufficient detail and scope to verify compliance with the requirements of the contract documents.

Piping Materials
Supporting Elements
Sprinkler Riser Equipment
Riser Alarm Equipment
Compressed Air Supply Equipment
Fire Department Connections
Preaction Control Systems
Standpipe Equipment
Sprinkler Heads
Valves
Miscellaneous Materials
Identification tags
Sound Stopping
Fire Stopping
Inspector's Test Valve

Submit equipment and performance data for Fire-Protection System consisting of information on useful life, system functional flows, safety features, and mechanical automated details.

SD-05 Design Data

Submit Design Analysis and Hydraulic Calculations for automatic sprinkler systems in accordance with paragraph entitled, "System Requirements," of this section.

Provide hydraulic calculations for the hydraulic remote area of each riser and each occupancy classification. Calculations must be signed and sealed by a Professional Engineer, licensed to practice in Florida.

SD-06 Test Reports

Submit Test Reports for the following tests in accordance with the paragraph entitled, "System Testing," of this section.

Pressure Tests
Air Tests
Valve-Operating Tests
Drainage Tests
Inspector'S Valve Station Tests
Pneumatic Tests
System Operating Tests

SD-07 Certificates

Submit Quality Assurance Plan in accordance with paragraph entitled, "Quality Assurance Plan," of this section.

Submit certification of test gauge accuracy per paragraph entitled, "Test Gauges".

SD-10 Operation and Maintenance Data

Submit Operation and Maintenance Manuals in accordance with paragraph entitled, "Operation and Maintenance," of this section.

1.4 GENERAL REQUIREMENTS

Section 23 00 00 AIR SUPPLY, DISTRIBUTION, AND EXHAUST SYSTEMS applies to work specified in this section.

Submit Connection Diagrams indicating the relations and connections of the following items. Drawings must indicate the general physical layout of all controls, and internal tubing and wiring details.

Submit Schematics and Fabrication Drawings for preaction sprinkler systems indicating functional and physical interfaces with facilities and other systems.

Submit Schematics and Fabrication Drawings for Preaction Sprinkler Systems consisting of fabrication and assembly drawings to be performed in the shop prior to installation and at the actual job site. Fabrication drawings must meet all requirements in NFPA 13, stipulated for "working plans" to include a building cross section. Working plans must be signed and sealed by a Professional Engineer, licensed to practice in the state of Florida.

Working Plans must indicate all sprinkler piping (size and length), pipe hangers, sprinkler head type and locations, valves, riser trim and associated components, etc. to comply with NFPA 13, "Working Plans." Locate sprinkler heads in a consistent pattern with ceiling grid, lights, and supply and return air diffusers. For spaces with lay-in type ceilings, locate heads in center of tile, unless otherwise approved by the Contracting Officer. The design must give full consideration to blind spaces, other system piping, electrical equipment, HVAC ductwork, and all other types of obstructions which could prevent the proper installation and operation of the preaction sprinkler systems.

Submit As-Built drawings for approval 21 days prior to the acceptance testing phase of the project as described in the paragraph entitled, "System Testing," of this specification section. Provide two (2) sets of

magnetic media and hard copies of all new and revised software and drawings with the submittal. As-Built drawings must document final system configuration including deviations from and amendments to the drawings, and field installation changes, concealed and visible.

Provide .DWG Format computer generated floor plan layouts indicating all wet pipe sprinkler system components.

As-built drawings and hydraulic calculations must be signed and sealed by a Licensed Professional Engineer registered in the state of Florida.

Submit Contractor's State Certification to the Contracting Officer for approval prior to any work being started on the Preaction Sprinkler System.

Fully verified and dated copies of all test data and results must be submitted with a copy of the approved test procedure and any factory test information.

Provide one copy of the test procedures and recording forms for the preliminary tests. For the final acceptance tests, provide 10 copies of the test procedures and recording forms.

Fire Service Floor Plans must indicate location of the preaction automatic sprinkler system risers, sprinkler piping (size and length), pipe hangers, preaction compressor and disconnect switch, sprinkler head type and locations, valves, riser trim and associated components, etc. to comply with NFPA 13 "Working Plans". [Coordinate with the requirements of the Fire Alarm System Fire Service Floor Plan such that all fire alarm and suppression system devices are combined on a single Fire Service Floor Plan.] Provide a symbol legend, which clearly identifies each device shown on the Fire Service Floor Plan. Install a copy of the Fire Service Floor plan minimum size (0.457 by 0.61 meters18 inches by 24 inches) in a painted metal frame with flexiglass plexiglass cover. The floor plan and it's location must be submitted for approval to the Contracting Officer prior to installation.

Submit Records of Existing Conditions showing the results of Contractor's survey of work area conditions and features of existing structures and facilities within and adjacent to the job site. Commencement of work constitutes acceptance of existing conditions.

1.5 SYSTEM REQUIREMENTS

The work includes designing and providing a new automatic preaction sprinkler system consisting of but not limited to a [double interlocked pneumatic/electric][single interlocked electric] releasing preaction valve with all associated trim, air compressor with air maintenance device, OS&Y isolation valve(s), floor drains, pressure switches, and dry pendant sprinkler heads. The preaction sprinkler system must be hydraulically designed to meet density and area of coverage requirements. The design, equipment, materials, installation, workmanship, examination, inspection, and testing must be in strict accordance with the required and advisory provisions of NFPA 13, NFPA 24, NFPA 72 and NFPA 75 except as modified herein. Each system must include all materials, accessories, and equipment inside and outside the building to provide an operationally compliant system. The system design must give full consideration to blind spaces, piping, electrical equipment, ductwork, and other construction and equipment in accordance with detailed drawings to be submitted for approval prior to installation. Locate sprinkler heads in a consistent pattern with

ceiling grids, lights, speakers, supply diffusers, return diffusers, and other ceiling mounted items.

Provide all additional equipment, junction boxes, conduit, and labor to meet the requirements and intent of this specification.

Submit Design Analysis and Calculations for automatic sprinkler systems and standpipe systems to provide uniform distribution of water over the design area. Design data must include design density, hydraulically most remote area, occupancy classification, sprinkler head orifice size and pipe velocities. Specify the design density in gpm per sq ft or L/m per sq m of floor area. Discharge from individual heads in the hydraulically most remote area must be between 100 percent and 120 percent of the specified density.

Systems must be designed such that pipe velocities do not exceed 6.1 meters/second 20 feet per second.

1.6 QUALITY ASSURANCE PLAN

Equipment to be provided under this specification must be that manufactured sprinkler system equipment which meets the requirements of the section entitled, "System Requirements." It must be the latest standard design, and must be listed by Underwriters' Laboratories or approved by Factory Mutual and must be suitable for the intended use.

Components installed under this contract cannot be more than one year older than the date of installation.

Prepare a test procedure and test record forms for conducting and recording complete tests on preaction sprinkler systems installed in accordance with the hydraulic calculations, the installation drawings and these specifications. Submit for approval the test procedure to the Contracting Officer at least 30 days prior to the preliminary system test described in the paragraph entitled, "System Testing," of this specification section. Test procedure must identify each sprinkler component to be tested, describe the initial condition, each step or function in the test, required test results, and equipment to be employed. Provide test forms with suitable spaces for recording test results on all equipment, devices, and wiring to be tested. Test record forms must also have identified spaces for verification signatures of official witnesses and dates of the test.

Submit proof that all components are Underwriter Laboratory (UL Fire Prot Dir) listed or Factory Mutual (FM P7825) approved for their intended use and function. [Materials and equipment furnished must be compatible with the existing system.]

1.7 SERVICES OF A CERTIFIED AUTOMATIC SPRINKLER SPECIALIST

Services of a Certified Specialist thoroughly experienced in automatic sprinkler system installations must be provided on site to perform or directly supervise the installation, make all necessary adjustments and perform all tests on the wet pipe sprinkler system at the site.

Sprinkler System Specialist is considered certified when the specialist holds a valid Sprinkler System Layout, Level III Certification from the National Institute for Certification in Engineering Technologies NICET 1014-7 or is licensed by the State of Florida as a Contractor Class I in accordance with Florida State Statute, Chapter 633, Section 633.521 and

holds a current Certificate of Competency.

Certification of other recognized agencies with equivalent requirements are considered. Evidence of the Contractor's State Certification and the basis of certification must be provided to the Contracting Officer and be approved by the Contracting Officer prior to any work being performed at Kennedy Space Center.

PART 2 PRODUCTS

2.1 PIPING MATERIALS

2.1.1 Type BCS - Black Carbon Steel

Pipe [DN 6 through DN 501 /8 through 2 inches]: Schedule 40 furnace butt weld black-carbon steel conforming to ASTM A 53/A 53M, ASTM A 135/A 135M, or ASTM A 795/A 795M, Type F furnace butt welded.

Pipe DN 65 through DN 206 2-1/2 through 8 inches): Schedule 40 seamless or electric-resistance welded black carbon steel, conforming to ASTM A 53/A 53M, ASTM A 135/A 135M, or ASTM A 795/A 795M Type E (electric-resistance welded), Grade B, or Type S (seamless), Grade B.

Unions (DN 50 and under2 inches and under): 2068 kilopascals 300-psi pounds per square inch gage (psig) working steam pressure (wsp) female, screwed, black malleable iron, with ground joint and brass-to-iron seat conforming to ASME B16.39

Standard Pipe Couplings: Extra-heavy screwed black steel.

Fittings (DN 50 and under2 inches and under): 1207 kilopascals 175 psi working pressure, cast iron, screwed conforming to ASTM A 126, Class A, and ASME B16.4.

Fittings (DN 65 and larger 2-1/2 inches and larger): 1207 kilopascals175 psiworking pressure, wrought steel, buttweld fittings, wall thickness to match piping system, complying with ASME B16.9 and 68 kilogram 150 pound steel flanges complying with ASME B16.5.

Elbows: Must be of the long radius type.

Grooved pipe couplings (all sizes): 207 kilopascals 175-psig minimum working pressure with a housing fabricated in two or more parts of black malleable-iron castings. Coupling gasket must be molded of synthetic rubber, conforming to requirements of ASTM D 2000. Coupling bolts must be oval-neck, track-head type with heavy hexagonal nuts, conforming to ASTM A 183

Grooved fittings (all sizes): 1207 kilopascals175-psig working pressure fittings used with grooved couplings must be fabricated of black malleable-iron castings, and be of the same manufacture as the pipe coupling. If a manufacturer's standard-size malleable-iron fitting pattern is not available, use fabricated fittings; fittings must be fabricated from Grade B seamless-steel pipe and long-radius seamless welding fittings, with wall thickness to match pipe, conforming to ASTM A 234/A 234M and ASME B16.9.

Bushings must not be used, use only pre-manufactured concentric or eccentric reducing fittings or reducing tees/elbows to reduce pipe size.

Pre-manufactured shaped welded outlets (weld-o-lets) are allowed to be used in lieu of "tee" fittings, where the branch pipe outlet is at least one pipe diameter smaller than the main.

Non-grooved products which rely in any way upon gasketing, clamps, straps, or setscrews for maintaining system integrity must not be used.

Adjustable "drop nipples" which utilize an O-ring type seal arrangement must not be used.

2.2 SUPPORTING ELEMENTS

Provide piping system components and miscellaneous supporting elements, including, but not limited to, building-structure attachments; standpipe equipment and fire hose cabinet stations; supplementary steel; hanger rods, stanchions, and fixtures; vertical-pipe attachments; horizontal-pipe attachments; restraining anchors; and guides. Supporting elements must be suitable for stresses imposed by systems pressures and temperatures, natural, and other external forces. Include an additional 113 kilogram 250 pound load at each anchor per NFPA 13.

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NOTE: Refer to Section 23 05 48.00 40 VIBRATION ISOLATION FOR AIR CONDITIONING EQUIPMENT if design can induce vibration considerations. requires vibration isolation.

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Supporting elements must be FM approved or UL listed and must conform to ASME B31.1, MSS SP-58, and ASME B16.34.

2.2.1 Building-Structure Attachments

2.2.1.1 Anchor Devices, Concrete and Masonry

Anchor devices must conform to FS A-A-1922, FS A-A-1923, FS A-A-1924A, FS A-A-1925, FS A-A-55614 and FS A-A-55615:

Group I: Shield, expansion (lead, bolt, and stud anchors)

Group II: Shield, expansion (bolt anchors), Type 2, Class 2, Style 1 or 2

Group III: Shield, expansion (self drilling tubular expansion shell bolt anchors

Cast-in floor-mounted equipment-anchor devices must provide adjustable positions.

Powder-actuated anchoring devices must not be used to support mechanical-systems components.

2.2.1.2 Beam Clamps

Beam clamps must be center-loading Types 21, 28, 29, and 30, UL listed, cataloged, and load-rated commercially manufactured products.

Type 20 beam clamps are allowed to be used for pipe DN 50 2 inches and

under.

Where Type 25 beam clamps are used, use two per point of pipe support.

2.2.1.3 C-Clamps

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NOTE: Avoid C-clamps, as a means of attaching hangers to structural steel. Z-Purlin Beam Clamps can be used if approved by the contracting officer and KSC AHJ. Where used, consider vibration forces and single or accumulated load and resultant moment on structural steel.
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C-clamps must not be used.

2.2.1.4 Inserts, Concrete

Concrete inserts must be constructed in accordance with the requirements of MSS SP-58 for Type 18 or 19 and ASME B16.34. When applied to piping in sizes DN 50 2-inch iron pipe size (ips) and larger, and where otherwise required by imposed loads, a 304.8 millimeter 1-foot length of 12.7 millimeter 1/2-inch reinforcing rod must be inserted and wired through wing slots.

2.2.2 Horizontal-Pipe Attachments

2.2.3 Single Pipes

Piping in sizes up to and including DN 50 2-inch ips must be supported by Type 1, 5, 6, 7, 9, 10, 11, or 12 solid, split-ring, or band type attachments.

Piping in sizes DN 65 2-1/2 inches and larger must be supported by Type 1, 2, 3, or 4 attachments or with Type 41 or Type 49 pipe rolls.

2.2.4 Parallel Fire-Protection Pipes

Use trapeze hangers fabricated from approved structural steel shapes, with U-bolts, when so specified. Structural-steel shapes must conform to supplementary steel requirements or the support must be of commercially available, approved proprietary-design rolled steel.

2.2.5 Vertical-Pipe Attachments

Single vertical-pipe attachments must be Type 8.

2.2.6 Hanger Rods and Fixtures

Use only circular solid cross section rod hangers to connect building structure attachments to pipe-support devices. Use pipe, straps, or bars of equivalent strength for hangers.

Provide turnbuckles, swing eyes, and clevises as required by support system to accommodate temperature changes, pipe accessibility, and adjustment for load and pitch.

2.2.7 Supplementary Steel

Where it is necessary to frame structural members between existing members or where structural members are used in lieu of commercially rated supports, such supplementary steel must be designed and fabricated in accordance with AISC 317.

Supplementary steel must be hot dipped galvanized or otherwise protected from corrosion as acceptable to the Contracting Officer.

2.3 SPRINKLER RISER EQUIPMENT

Riser alarm equipment must be UL listed or FM approved for fire-protection use.

2.3.1 Standard Check Valve

Check valve must be UL listed or FM approved standard swing-check type with elastomer-disc seat. Check valve must have a ductile iron body with flanged or grooved ends and be of the clear opening type with flanged inspection and access cover plate for sizes DN 100 4 inches and larger. Check valve must be able to be installed vertically or horizontally, and be rated for 2068 kilopascals 300 psi working pressure. Clapper must be type 304 stainless steel or bronze with field replaceable EDPM or Nitrite seal, with nickel or bronze seat. Spring, hinge shaft and retaining ring must be stainless steel, the valve body must be painted with a corrosion resistant non-lead coating.

2.3.2 Preaction Valve

Preaction valve must be a Viking [double interlocked pneumatic/electric] [single interlocked electric] interlocking deluge type complete with standard accessories and trim necessary to give a water flow alarm, supervisory alarm for low air pressure, must include pressure gages, accelerator, priming provisions, testing provisions, deluge valve, supervisor air compressor, release system and all required compressed-air and water piping, fittings, and valves. Install accelerator(s) as needed to meet the 60 second discharge time required by the "System Testing" portion of this specification.

Deluge valve must be of the diaphragm type with field replaceable diaphragm and seat EDPM materials, without removal from the system. Valves must be constructed of ductile iron, rated for a minimum 1207 kilopascals 175 psi working pressure. Valve must be [double interlocked electric/pneumatic] [single interlock electric] releasing type and must be designed to allow for resetting without having to open the valve. Provide the manufacturers standard trim package consisting of all gauges, manual release station, unions, fittings, drains and valves as required for a completely functional installation. Trim piping and fittings must be galvanized.

System must include pressure switches to indicate alarm and supervisory trouble corresponding to an increase in water pressure or a loss of air pressure respectively.

Coordinate preaction activation with the requirements of Section 21 09 00.00 98 PREACTION CONTROL SYSTEMS.

Releasing means must be through a solenoid valve.

The solenoid valve must be an electrically operated control valve UL listed or FM approved for releasing of [deluge][preaction] sprinkler valves. The solenoid must be the normally closed type and must be electrically energized to open.

Provide a suppression system safing/disconnect switch for maintenance purposes. Disconnect both conductors upon switching. Circuits must be Class B, with yellow positive/violet negative conductors. Item must be Best Lock Switch No. 1W702-S4D, installed in a separate enclosure, with an engraved phenolic sign stating, "Preaction System Safing Switch".

2.4 COMPRESSED AIR SUPPLY EQUIPMENT

2.4.1 Riser Mounted Compressed Air Independent Source Supply

Preaction system air pressure must be maintained by an independent air compressor mounted on the riser. Compressor must be spring and elastomer vibration-isolated from the riser, of oil-free construction, complete with adjustable set point low-differential pressure switch, check valve, and necessary unloader and intercomponent piping and wiring. Provide spare inlet-air filter media.

Supply power for the compressed air system as indicated on the drawings. Provide an independent, properly fused safety disconnect switch with provisions for locking the covers and operating handles in both the "Power ON" and "Power OFF" positions. Locate the disconnect switch within 914 millimeter 3 feet of the compressor. Paint the disconnect switch with two coats of enamel, color No 11105 (red) and permanently affix a label, which must read "Preaction Compressor Disconnect Switch - Fed from Panel [_____] CKT No. [_____]."

2.4.2 Floor/Wall Mounted Compressed Air Supply

Provide [floor] [wall] mounted compressed air system complete with air compressor, pressure gages, pressure switches, air maintenance devices, desiccant air dryer and appurtenances. Compressed air system must maintain [275] kilopascals [40] pounds per square inch air pressure on the preaction system piping and must transmit a supervisory trouble alarm to the fire alarm control panel when pressure drops below [207] kilopascals [30] pounds per square inch. The pressure switch for controlling the compressor must be field adjustable for both the "on" and "off" pressure settings. The air maintenance device with a by-pass line for fast filling the system must include an air strainer, air pressure regulator, air restrictor, air check valve, and all other associated piping, valves and fittings. Compressor must be spring and elastomer vibration-isolated from the floor. Pressure gages must be air or oil type calibrated in pounds per square inch. Supply power for the compressed air system as indicated on the drawings. Provide an independent, properly fused safety disconnect switch with provisions for locking the covers and operating handles in both the "Power ON" and "Power OFF" positions. Locate the disconnect switch within 914 millimeter 3 feet of the compressor. Paint the disconnect switch with two coats of enamel, color No 11105 (red) and permanently affix a label, which must read "preaction Compressor Disconnect Switch - Fed from Panel [_____] CKT No. [_____]".

2.4.2.1 Compressed Air By-Pass Line

Provide air-supply line near for each preaction valve with an orifice union with a 6 millimeter 1/8-inch orifice corrosion-resistant steel plate,

externally identified, and a 13 millimeter 1/2-inch 19 millimeter [3/4 inch] three-valve by-pass around the orifice union.

2.4.2.2 Low Air Pressure Supervisory Switch

Provide low air pressure supervisory switch for the preaction sprinkler system and connect to the building fire alarm control panel to activate the system supervisory alarm when air pressure in the sprinkler system drops below [207] kilopascals [30] psig. Provide a bleeder valve in the airline ahead of the switch for testing operation of the low air pressure switch.

2.4.2.3 Water Flow Alarm Device

Water flow alarm devices must be UL listed for the particular type of system. Water flow switch must be wired to make or break a circuit on rise of water pressure.

Water flow alarm device must have a design working pressure of 2068 kilopascal 300 psi, include two sets of single pole, double throw contacts rated for not less than 2.0 amps at 30 VDC. Housing must be die-cast, suitable for both indoor and outdoor use and include knockouts for conduit connections.

2.4.2.4 Pressure Gauge

Pressure gauge must be a minimum 89 millimeter 3.5 inch in diameter, brass or stainless steel case with chrome finish, glass or polycarbonate window, brass dial with white background, black markings, dual units (English and Metric), phosphor bronze bourdon tube, brass precision geared movement, plus or minus 3 percent accuracy, 2068 kilopascals 300 psi working pressure, and three-way globe style gauge isolation valve with plugged end.

2.4.2.5 Inspector's Test

The inspector's test valve must be a combination test and drain device (OFF-TEST-DRAIN), bronze body, bronze ball valve, one quarter turn handle, integral sightglass (on discharge side), and internal corrosion resistant orifice, sized to match the sprinkler head orifice size.

2.5 FIRE DEPARTMENT CONNECTIONS

Hose connections must have National Fire hose standard-thread form and rocker lugs in accordance with NFPA 1963. Hose connection sizes and threads must be compatible with the equipment used by the fire department serving the facility.

2.5.1 Wall Siamese

Unit must be cast brass or bronze flush-mounted escutcheon-plate type, with two DN 65 2 1/2-inch, fire-department, swivel, female inlets; double-clapper valves; rocker-lug caps and chains; and cast-in function-identifying lettering. Finish must be chrome-plated or polished surface. Chrome plate must be in accordance with ASME A112.18.1.

2.5.2 Sidewalk Siamese

Unit must be cast brass or bronze, with two DN 65 2 1/2-inch, fire-department, swivel, female inlets; double-clapper valves; rocker-lug caps and chains; and cast-in function-identifying lettering. Finish must

be chrome-plated or polished surface. Chrome plate must be in accordance with ASME A112.18.1. Unit must be mounted on a Schedule 40 ASTM A 53/A 53M galvanized carbon-steel pipe with red-enameled finish on prime-coated surface. All surfaces embedded in concrete or below grade must be protected with a 20-mil thick bituminous coating.

2.5.3 Wall Hydrant

Unit must be cast brass or bronze flush-mounted escutcheon-plate type with two DN 65 2 1/2-inch, fire-department, male outlets; rocker-lug caps and chains; and cast-in function-identifying lettering. Finish must be chrome-plated or polished surface. Chrome plate must be in accordance with ASME A112.18.1.

2.6 SPRINKLER HEADS

2.6.1 Head Types

Use standard 12.7 millimeter 1/2-inch orifice [dry pendant] sprinkler heads.

Heads in finished areas below suspended ceilings must be semi-recessed chrome-plated brass. Escutcheon plate must be brass with a baked enamel finish to match ceiling, or chrome plated.

[Heads required to be located in the center of the suspended ceiling tiles must use return bends or FM approve FlexHead commercial ceiling sprinkler assembly with a maximum overall length of 2.1 meters 7 feet.]

Heads required to be concealed where the appearance of a smooth ceilings is required must use concealed pendent type heads with a low-profile small-diameter cover plate with a factory applied finish to match suspended ceiling tiles.

[Heads required to be located in the center of the suspended ceiling tiles must use return bends.]

2.6.2 Temperature Rating

Fusible links must be .ordinary temperature classification, except where otherwise indicated, or locations as defined in NFPA 13 requiring intermediate or high temperature heads.

2.6.3 Spares

Furnish spares for each type of sprinkler head, complete with appropriate storage cabinet and wrench. Number of heads must be in accordance with NFPA 13. Mount cabinet next to riser or other location as directed by the Contracting Officer.

2.6.4 Head Protection

Protect heads with paper or plastic bags during painting operations. Remove protection immediately upon finishing painting operations.

Head guards must be constructed of steel wire provided wherever mechanical damage could occur. Guard finish must be red enamel.

2.7 VALVES

2.7.1 Aboveground

Gate, globe, and check valves (all sizes) must be FM approved or UL listed.

Ball valves, DN 50 2 inches and under, must be FM approved, rated 2070 kilopascals 300 psi, with provisions to wire or lock handle in place where critical alarm function is isolated.

Gate valves must be of the outside screw and yoke configuration, cast iron body and wedge, bronze yoke bushing, seat ring and face ring. Wedge must be solid and must be constructed of cast iron or bronze. Valves must be flanged or grooved and rated for 1206 kilopascals 175 psi non-shock cold water.

Angle valves (for main drain) must have bodies constructed of bronze with bronze disk, screwed or union bonnet type. Disk seat must be rubber. Valves must have screwed ends and be rated for 1206 kilopascals 175 psi non-shock cold water.

All control and isolation valves must be supervised using a tamper switch.

2.8 MISCELLANEOUS MATERIALS

2.8.1 Bolting

Flange and general-purpose bolting must be hex-head and must conform to ASTM A 307, Grade B, ASTM F 568M, Class 4.8 or higher. Heavy hex-nuts must conform to ASTM A 563 and ASTM A 563M. Square-head bolts and nuts are not acceptable.

2.8.2 Escutcheons

Escutcheons must be manufactured from nonferrous metals and must be chrome-plated, except when AISI 300 series corrosion-resistant steel is provided. Metals and finish must conform to ASME A112.18.1.

Escutcheons must be one-piece type where mounted on chrome-plated pipe or tubing and one-piece or split-pattern type elsewhere. Escutcheons must have provisions consisting of internal spring tension devices or setscrews to maintain a fixed position against a surface.

2.8.3 Flange Gaskets

Gaskets must be suitable for the intended use and must contain no asbestos.

2.8.4 Pipe-Thread Compounds

Use tetrafluoroethylene tape or other suitable compounds.

2.9 FIRE-PROTECTION SYSTEM IDENTIFICATION

Provide a coordinated system of piping and equipment identification which includes the following:

Framed and plastic-protected diagrammatic layout of all piping systems, identifying and locating piping, equipment, and valves. Where existing systems are being modified, existing layouts must be brought up to date.

Metal-tag-identified major valves, piping-system components, and equipment

Metal identification plate at controlling alarm valve identifying system and area protected

Service-labeled piping

2.9.1 Diagrams

Chart listing of equipment must be by designation number and must show pertinent data. Diagrams must be neat, mechanical drawings mounted in extruded aluminum frames, with 3 millimeter 1/8-inch thick acrylic plastic protection. Location must be as directed by the Contracting Officer. Provide a minimum of one mounted chart and diagram, plus one extra copy of each, for each fire-protection system.

2.9.2 Metal Tags

Identification tags made of brass or aluminum and indicating function of valve or similar component, must be installed on such system devices. Tags must be not less than DN 50 2 inches in diameter and marking must be stamped.

Provide equipment with metal identification tags bearing an equipment designation number matching the drawing or diagram designations.

Tags must be secured to valve or equipment items with 2.7 millimeter 12-gauge galvanized wire.

Provide risers with a stamped metal tag containing the hydraulic design data. Main drain and inspectors test stations must also be identified using metal nameplates with minimum 50 millimeter 2 inch high lettering chained to the valve.

2.9.3 Service Labeling

Piping, including that concealed in accessible spaces, must be labeled to designate service. Each label must include an arrow or arrows to indicate flow direction. Labels or tag designations must be as follows:

SERVICE	LABEL OR TAG DESIGNATION
Main sprinkler supply	MAIN SPRINKLER SUPPLY
Sprinkler riser number	SPRINKLER RISER NO.
Sprinkler branch	SPRINKLER BRANCH
Standpipe equipment	STANDPIPE

Label and arrow piping in accordance with the following:

Each point of entry and exit through walls

Each change in direction

In congested or hidden areas, at each point required to clarify service

or indicate hazard

In long straight runs, locate labels at a distance visible to each other, but in no case must the distance between labels exceed 12.2 meters 40 feet.

Label lettering must be 50 millimeter 2 inches high. Where the size of pipes is 65 millimeter 2-1/2-inch outside diameter and smaller, attach labels to 1.6 millimeter 16-gauge aluminum sheet which must be attached to the pipe with 2.7 millimeter 12-gauge galvanized wire. Labels must be legible from the primary service and operating area.

Labels must be made of self-sticking plastic film designed for permanent installation. Labels must have red letters on white background.

Label and valve tag schedule above must not be construed as defining or limiting the work. All piping systems must be labeled.

2.10 PAINTING

Furnish equipment of the manufacturer's standard product with the manufacturer's standard finish coat.

Other mechanical equipment must be furnished with a shop-applied prime paint.

2.11 MAIN DRAINS

Provide dedicated drain piping at riser [to discharge to the building exterior][or][to discharge to sight cones attached to drains of adequate size to readily accept the full flow from each drain under maximum pressure]. Discharge location must be selected to avoid creating a nuisance or hazardous condition and must be acceptable to the Contracting Officer. For multi-story buildings using a common drain system, increase drain size by one pipe size as required by NFPA.

Penetration of exterior walls must be sleeved and caulked and be no greater than 610 millimeter 24 inches and no less than 152 millimeter 6 inches above grade. Drain lines to terminate in a 45 or 90 degree elbow turned down discharging to a 450 millimeter 18 inch concrete splashblock.

PART 3 EXECUTION

****
NOTE: Rewrite following paragraph if no NFPA 13, NFPA 13E, NFPA 14, or NFPA 24 work is included in project.
****

3.1 GENERAL

Installation of system materials and equipment must be in accordance with the recommendations and provisions of NFPA 13, NFPA 13E, NFPA 14, and NFPA 24, and related Codes and Standards contained herein. Perform work in the presence of the Contracting Officer who must be notified by the Contractor 48 hours in advance of the start of work.

Perform all installation work by licensed fire protection sprinkler

contractors, licensed for such work in the state where the work is to be performed.

The riser locations, as well as the number shown on the drawings are approximate in nature, and must be coordinated with the building construction, system design, Code requirements, and water supply limitations and maintenance requirements. The number of risers shown on the documents are the minimum to be provided. The exact location and number must be reflected on the Contractor's shop drawing submittal and must be as approved by the Contracting Officer.

For heads which could be damaged, provide wire head guards. For heads located beneath other heads where the spray from the upper head could cool the lower head, provide water shields. For locations where existing building elements could disrupt sprinkler or nozzle spray patterns, provide multiple levels of protection.

Provide return bends for systems with non-potable water sources.

Install piping level flat or sloped back to the riser to allow for drainage. Where trapped piping is unavoidable, provide auxiliary drains.

3.2 ABOVEGROUND PIPING-SYSTEMS INSTALLATION

Run piping parallel with the lines of the building. Space and install piping and components so that a threaded pipe fitting is removable between adjacent pipes and so that there is not less than 12.7 millimeter 1/2 inch of clear space between the finished surface and other work and between the finished surface of parallel adjacent piping. Hangers on different adjacent service lines running parallel must be arranged to be in line with each other and parallel to the lines of the building.

Load rating for pipe-hanger supports must be based on all lines filled with water. Deflection per span must not exceed slope gradient of pipe. Schedule 40 and heavier ferrous pipe supports must be in accordance with the following minimum rod size and maximum allowable hanger spacing. For concentrated loads such as valves, reduce allowable span proportionately.

PIPE SIZE (DN)	ROD SIZE (Millimeters)	HANGER SPACING FOR STEEL PIPE (Millimeters}
Up to 1	3/8	8
1-1/4	3/8	12
1-1/2	3/8	15
2-1/2 to 3-1/2	3/8	15
5	1/2	15
6	1/2	15
8	1/2	15
Up to 25	10	2400
32	10	3600

PIPE SIZE (DN)	ROD SIZE (Millimeters)	HANGER SPACING FOR STEEL PIPE (Millimeters}
40	10	4500
65 to 90	10	4500
125	15	4500
150	15	4500
200	15	4500

PIPE SIZE (INCHES)	ROD SIZE (INCHES)	HANGER SPACING FOR STEEL PIPE (FEET)
Up to 1	3/8	8
1-1/4	3/8	12
1-1/2	3/8	15
2-1/2 to 3-1/2	3/8	15
5	1/2	15
6	1/2	15
8	1/2	15

Support vertical risers at the base where possible and at intervals specified. Piping must be guided for lateral stability as necessary. Place clamps under fittings wherever possible. Support carbon-steel pipe at each floor at not more than 4.5 meter 15 feet intervals for pipe DN 50 2 inches and smaller, and at not more than 6.1 meter 20 feet intervals for pipe DN 65 2-1/2 inches and larger.

Piping must be securely supported with allowance for thrust forces and thermal expansion and contraction and must not be subject to mechanical, chemical, vibrational, or other damage, in conformance with ASME B31.1.

Extend riser main drain piping full size to discharge outdoors in a location approved by the Contracting Officer.

Locate inspectors test valve approximately 1.5 meters 5 feet above finished floor. Provide inspectors test for each sprinkler system or portion thereof, equipped with an alarm device for testing purposes. Locate inspectors test at the hydraulically most remote portion of the sprinkler system. Inspectors test must [discharge to the building exterior] [or] [discharge to a drain location sized to accommodate the full flow] without resulting in property damage. Discharge to janitors sinks and similar locations must not be permitted.

Penetrations of exterior walls must be no greater than 610 millimeter 24 inches and no less than 152 millimeter 6 inches above grade, and be sleeved and caulked. Inspector test discharge must terminate in a 45 or 90 degree

elbow turned down, discharging to an 450 millimeter 18 inch concrete splashblock. Size inspectors test lines to be capable of development of the design flow from one sprinkler without creating excessive back pressure.

Install piping level flat or sloped back towards the riser or the auxiliary drains to allow for drainage. Where trapped piping is unavoidable, provide auxiliary drains.

3.3 SOUND STOPPING

Provide effective sound stopping and adequate operating clearance to prevent structure contact where piping penetrates walls, floors, or ceilings; into occupied spaces adjacent to equipment rooms; where similar penetrations occur between occupied spaces; and where penetrations occur from pipe chases into occupied spaces. Occupied spaces include space above ceiling where no special acoustic treatment of ceiling is provided. Finish penetrations to be compatible with surface being penetrated.

Sound stopping and vapor-barrier sealing of pipe shafts, and large floor and wall openings can be accomplished by packing with properly supported mineral fiber insulation or by foaming-in-place with self-extinguishing, 0.9 kilogram 2-pound density polyurethane foam to a depth not less than 152 millimeter 6 inches. Finish foam with a rasp. Vapor barrier must be not less than 3 millimeter 1/8-inch thickness of vinyl mastic applied to visible and accessible surfaces.

3.4 FIRE STOPPING

Through-penetrations in fire walls, partitions, or any floors to allow passage of cables, ducts, pipes and conduits must be sealed with a "fire stopping assembly" that is UL listed or FM approved with a fire-resistance rating equal to the fire resistance rating of the walls, partitions, or floors in accordance with NFPA 251. For sealing purposes all floors must be considered to have a fire resistance rating of 2 hours. Openings no longer required must be sealed with a material of equal or greater fire resistance to that of the walls, partitions, or floors.

3.5 SLEEVES

Provide sleeves where piping passes through roofs, masonry or concrete walls, or floors.

Sleeves passing through steel decks must be continuously welded or brazed to the deck.

Sleeves extending through floors, roofs, or load-bearing walls, and sleeves through fire barriers must be continuous and fabricated from Schedule 40 steel pipe with welded anchor lugs. Form other sleeves by molded linear polyethylene liners or similar materials that are removable. Diameter of sleeves must be large enough to accommodate pipe, insulation, and jacketing without touching the sleeve, and additionally must provide a minimum 10 millimeter 3/8-inch clearance. Sleeve must accommodate mechanical and thermal motion of pipe to preclude transmission of vibration to walls and generation of noise.

Space between a pipe and the inside of a pipe sleeve or a construction surface penetration must be packed solid with mineral fiber conforming to ASTM C 592 wherever the piping passes through firewalls, equipment-room walls, floors, and ceilings connected to occupied spaces, and other

locations where sleeves or construction-surface penetrations occur between occupied spaces. Where sleeves or construction-surface penetrations occur between conditioned and unconditioned spaces, the space between a pipe, bare or insulated, and the inside of a pipe sleeve or construction-surface penetration must be filled with an elastomer caulk to a depth of 12.7 millimeter 1/2 inch. Surfaces to be caulked must be oil- and grease-free.

Exterior wall sleeves must be caulked watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed components.

Where piping penetrates fire rated walls, partition, or any floor, it must be sleeved with a penetration protected by a UL approved penetration assembly, with a rating not less than that of the wall/floor penetrated. Sleeves for fire rated penetrations must meet the requirements of the UL approved penetration assembly.

3.6 ESCUTCHEONS

Provide escutcheons at penetrations of piping into finished areas. Where finished areas are separated by partitions through which piping passes, provide escutcheons on both sides of the partition. Where suspended ceilings are installed, provide plates at the underside only of such ceilings. Escutcheons must be chrome plated in occupied spaces and must conceal openings in building construction. Firmly attach escutcheons.

3.7 PAINTING

Manufacturer's standard-finish equipment surfaces damaged during construction must be brought to as-new condition by touchup or repainting to the satisfaction of the Contracting Officer, or replaced with new undamaged equipment at no additional cost to the Government.

Thoroughly clean hangers, supports, and other iron work in concealed spaces and paint with one coat of primer paint.

All automatic sprinkler and standpipe system piping, valves, and appurtenances, must receive two coats of enamel, color No. 11105 (red) in accordance with MIL-STD-101 and FED-STD-595.

3.8 ELECTRICAL WORK

Electrical work is specified in Division 16, "Electrical," for control system wiring which must be provided under Section 21 09 00.00 98 PREACTION CONTROL SYSTEMS and this section in accordance with UL 6 and NFPA 70. Use rigid metal conduit or intermediate metal conduit, except that electrical metallic tubing can be used in dry locations not enclosed in concrete or where not subject to mechanical damage.

All control and isolation valves must be supervised using a tamper switch.

3.9 SYSTEM TESTING

Prior to acceptance of the work, test completed systems in the presence of the Contracting Officer. Upon approval, provide certificates of testing.

Pressure tests must be hydrostatic, unless otherwise specified. Only use potable water for testing.

Perform System operating tests, air tests, pneumatic tests, valve-operating

tests, inspector's valve station tests and drainage tests, for preaction systems.

Full opening of the inspector's test connection, after the solenoid valve has been released (manually or automatically) must cause the preaction valve to trip and deliver a steady stream of water at the test outlet through a calibrated orifice (equivalent in diameter to a single system sprinkler head) within sixty (60) seconds. If a steady stream at the outlet can not be delivered within the 60 seconds then install an accelerator(s) per the manufacturer's requirements to meet the 60 second discharge time in accordance with NSS 1740.118719.11 NASA Safety Standard for Fire Protection.

Government will supply testing water at a location determined by the Contracting Officer, but the Contractor is responsible for approved disposal of test water.

Prepare and maintain test records of piping-system tests. Records must show personnel responsibilities, dates, test-gage identification numbers, ambient and test-water temperatures, pressure ranges, rates of pressure drops, and leakage rates. Each test acceptance requires the signature of the Contracting Officer.

3.10 TEST GAUGES

Test gages, to be acceptable, must have 115 millimeter 4-1/2-inch dials or larger with accuracy of plus or minus 1/2 of 1 percent of full-scale range and dial graduations and pointer width compatible with readability to within one-half of the accuracy extremes. Maximum permissible scale range for a given test must be such that the pointer during a test has a starting position at midpoint of the dial or within the middle third of the scale range. Certification of accuracy and correction table must bear a date within 90 days prior to the test, test gage number, and the project number.

3.11 TEST AND ACCEPTABLE CRITERIA

Test aboveground systems at 1378 kilopascal 200 psi or where the maximum normal working pressure exceeds 1034 kilopascal 150 psi test the system at the maximum normal working pressure plus 344 kilopascal 50 psi. Maintain the applied pressure without further addition of test media for not less than 2 hours. Maximum allowable pressure drop is 0 kilopascal 0 psi.

[Test underground systems, rubber-jointed ferrous-pipe water systems at 1378 kilopascal 200 psi or where the maximum normal working pressure exceeds 1034 kilopascal 150 psi test the system at the maximum normal working pressure plus 344 kilopascal 50 psi. Maintain the applied test pressure for not less than 2 hours. Maximum allowable pressure drop is 14 kilopascal 2 psi.]

Preaction systems also required an air pressure leakage test at275 kilopascals 40 psi. Maintain the applied pressure without further addition of test media for not less than 24 hours. Maximum allowable pressure drop must be 10.3 kilopascals 1-1/2 psi.

Test backflow prevention into connected potable-water systems and system devices for proper functioning under conditions normal to their application.

Repair dripping or weeping joints.

3.12 DISINFECTION

Water piping, including valves, fittings, and other devices, must be disinfected with a solution of chlorine and water. Solution must contain not less than 50 parts per million (ppm) of available chlorine. Hold solution for a period of not less than 8 hours, at which time the solution must contain a minimum residue of 2 ppm of available chlorine or the system must be re-disinfected. After successful disinfection thoroughly flush the piping before placing into service. Water for disinfection, and flushing will be furnished by the Government.

3.13 CLEANING AND ADJUSTING

At the completion of the work, thoroughly clean all parts of the installation. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that has accumulated from the installation and testing of the system. Adjust automatic control devices for proper operation.

3.14 OPERATION AND MAINTENANCE

Operation and Maintenance Manuals, grouped by technical sections consisting of manufacturer's standard brochures, schematics, procedures, recommended spare parts, recommended test equipment, and safety precautions. Submit this information prior to acceptance tests being performed.

-- End of Section --